normal signal/protection levels specified for the marine service. This means that we need to know the separation distance required for a receiver to receive a 5 dBu signal. Consider a 400' HAAT receiver and a 400' HAAT, 400 watt ERP transmitting facility.[2] The required separation distance is 227 km (141 mi). This is the minimum separation distance that a 400' HAAT, 400 watt ERP transmitter must be located from a 400' HAAT receiver for the median "undesired" receive signal not to exceed 5 dBu.

Co-channel interference between elevated base station transmitters/receivers can be resolved by ensuring that the fixed transmitters/receivers are located a sufficient distance apart--as determined above. This, however, is not the only type of interference that will be experienced. Of particularly concern in this type of operation is the fact that under the proposed pairing, the I/LT higher frequency "mobile" transmits on the coast station transmit frequency. Thus, I/LT mobiles will act like remote "mobile" coast stations. Thus, whenever such an I/LT mobile unit happens to be near a maritime area, the I/LT mobile operator can key the mobile radio and the mobile unit will act like a coast station to nearby maritime vessels. This type of interference with common carrier communications would be potentially very harmful. This type of interference cannot be resolved by using a specific co-channel separation distance. The only feasible resolution to this type of problem is to change the proposed I/LT usage of the frequency pairs to comport with the marine usage, namely: a) I/LT base station transmit must utilize the higher "coast" station transmit frequency; b) I/LT mobile station transmit must utilize the lower "ship" transmit frequency.

Proposed co-channel separation distances

In order to consider co-channel separation distances, it is first necessary to specify the co-channel parings to be utilized. In what follows, it is assumed that the proposed I/LT usage of the marine frequency pairs will utilize the same base/mobile paring--namely, the base transmit will utilize the higher frequency of each duplex pair with the lower frequency being utilized by the mobile transmit. [In analyzing the spacings proposed in the NPRM/NOI, it is also assumed that the NPRM/NOI intended the proposed I/LT base/mobile usage to match the present marine usage; without such an assumption, the spacings proposed in the NPRM/NOI would be technically meaningless.]

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[2]The following "average" propagation conditions were used:
Vertical Polarization
Average ground:
Relative Permittivity = 15
Conductivity = 0.005 Siemens per Meter
Continental Temperate Climate
N_s = 301 N-units
Terrain roughness, asymptotic value: 125'

Paragraph 41 of the NPRM/NOI, PR Docket No. 92-257, proposes a separation matrix between I/LT stations and navigable waterways and co-channel public coast stations. These geographic separations are based on protecting maritime operations within 43 kilometers (27 miles) of any co-channel public coast station. Footnote 73 states that:

> "The distances in the matrix were found using the propagation curves specified in Section 80.767 of the Commission's Rules, 47 C.F.R. § 87.767, assuming non-overlap of the 14 dBu interference contour of a proposed I/LT station with the 26 dBu service contour of any existing public coast station. The 26 dBu public coast station service contour is the sum of the current 17 dBu contour and the 9 dB antenna height factor suggested by CICS, and is assumed to be equal to 43 kilometers (27 miles)."

The resultant table is presented in the NPRM/NOI, Appendix A, "PROPOSED RULES", § 90.283 (d).

We are unable to reproduce the 27 mile 26 dBu service contour distance assumed by the FCC. Using the propagation curves of Section 80.767, we find that a 400 w ERP, 400' HAAT facility has a 26 dBu service contour distances of 50.8 miles. In order for a 400' AAT facility to have a 26 dBu service contour distance of 27 miles, the ERP would have to be reduced to 4 watts. Accordingly, the separation table proposed by the FCC is based on protecting the 26 dBu service contour of a 4 watt ERP, 400' AAT marine facility. Thus, all separation distances proposed are significantly too small.

We have reviewed the Engineering Study presented by CICS in its Reply Comments in RM-7956. We agree with the engineering validity of the information presented by CICS and suggest that this methodology be utilized to determine separation distances. The NPRM/NOI, however, while adopting some of the CICS concepts, did not apply them in the same manner as proposed by CICS. It is important to clarify the engineering differences. This CICS report proposes:

> Adoption of the basic Section 80.767 propagation curves and signal level/interference criteria, namely:
>
> > Service Contour entitled to protection: 17 dBu
> > Propagation Curves: Section 80.767, which utilize a 30' receive height
> > Protection ratio to be provided: 12 dB
>
> This means that a 5 dBu interference contour must not cross into a 17 dBu service contour.

This CICS Proposal utilized the following corrections:

- Overland terrain roughness causes a 2.25 dB additional path loss
- Land Mobile receivers are typically at 6 ft rather than 30 ft; the standard correction factor for this is 9 dB.
- Mobile Marine Receiver over land to receive a protected signal level of 17 dBu at a 30 ft receive elevation.
- I/LT mobile receive to receive a protected signal level of 17 dBu at a 6 ft receive elevation.

Applying the above corrections, CICS proposed the following service/interference contours:

Marine over-land:		
	19.25 dBu Service	
	16.25 dBu Interference	(The marine signal level that is 12 dB below the I/LT service level)
I/LT:		
	28.25 dBu Service	
	7.25 dBu Interference	(The I/LT signal level that is 12 dB below the marine service level)

Utilizing the § 80.767 propagation curves and assuming that the marine and I/LT facilities are both 400' HAAT, 400 watt ERP facilities, the following values are obtained:

Marine over-land:	
19.25 dBu Service Contour:	62.0 mi.
16.25 dBu Interf Contour:	68.5 mi.
I/LT:	
28.25 dBu Service Contour:	47.6 mi.
7.25 dBu Interf Contour:	93.3 mi.

The separation distance for neither facility to experience interference is the larger of the sum of the service contour and opposite interference contour[3], namely:

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[3]It is not sufficient to require that only the I/LT interference contour not go into the Marine Service contour; it is essential that the Marine interference contour also not go into the I/LT service contour. Both conditions are essential to ensure that an I/LT facility and its associated mobiles not interfere with a marine facility and its associated mobiles. The requirement that the I/LT interference contour not go into the marine service contour ensures that marine mobiles not receive interference from the I/LT base transmitter. The requirement that the Marine interference contour not go into the I/LT service contour ensures that the marine base receiver will not receive interference from I/LT mobile

Marine Service + I/LT Interf: 62.0 + 93.3 = 155.3 mi.
I/LT Service + Marine Interf: 47.6 + 68.5 = 116.1 mi.

The larger value is the required separation distance--namely 155.3 mi. This is illustrated in Exhibit 1.

The NPRM/NOI appears to suggest a 17 dBu signal level for a 6 ft receiver be protected for both the I/LT mobiles and the over-land marine mobiles.[4] Applying a 9 dB correction for 30' receive height, this means that both the marine over-land and I/LT facilities have a 26 dBu service contour and a 14 dBu interference contour. No over-land terrain roughness correction was applied.

Utilizing the § 80.767 propagation curves and assuming that the marine and I/LT facilities are both 400' HAAT, 400 watt ERP facilities, the following values are obtained:

Marine over-land:
26 dBu Service Contour: 50.8 mi.
14 dBu Interf Contour: 74.0 mi.

I/LT:
26 dBu Service Contour: 50.8 mi.
14 dBu Interf Contour: 74.0 mi.

The separation distance for neither facility to experience interference is the larger of the sum of the service contour and opposite interference contour, namely:

Marine Service + I/LT Interf: 50.8 + 74.0 = 124.8 mi.
I/LT Service + Marine Interf: 50.8 + 74.0 = 124.8 mi.

The larger value is the required separation distance--namely 124.8 mi. This is illustrated in Exhibit 2.

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transmissions (This follows from utilizing path reciprocity re base-mobile and mobile-base transmissions.) The converse is also true.

[4]It is important to note that the existing marine service/interference contour values of 17 dBu and 5 dBu, respectively, should not be changed. Maritime operations typically utilize open squelch; accordingly, existing FCC rules utilize significantly different values for service and interference contours than those typically used in land mobile common carrier operations. There is no engineering information presented that justifies making any changes to the present values. As suggested in the CICS proposal, however, it is appropriate to make engineering corrections for the fact that land mobile units typically utilize an antenna heights that are lower than the heights typically used on ships.

Utilizing the above considerations, the following table of required separation in miles of I/LT base station from a marine public coast station results:

I/LT Base Station

HAAT (ft)	ERP (watts) 400	300	200	100	50
100	108	107	104	101	98
200	116	114	112	109	105
400	125	123	121	117	113

This table provides 12 dB of protection to a 17 dBu signal at a 6 ft receiver.[5]
Note, the public coast station is always assumed to be at 400' HAAT, 400 watts ERP. From the above table, the I/LT base station, depending upon its HAAT and ERP, must be from 98 to 125 miles from a marine public coast station.

When there is no public coast station, the NPRM/NOI proposed to protect the nearest coastline of any navigable waterway as if there were a public coast station located at the coastline. Marine facilities are rarely located exactly at the coastline; often they are located several miles inland. Accordingly, we suggest that an additional 5 mi buffer be added to the separation distance. This would provide a reasonable amount of additional protection for someone to locate a future public coast station near the coast line.

Maximum Receiver Height

The NPRM/NOI, APPENDIX A, §90.283(c) proposes that I/LT mobiles may not have antenna heights more than 50 ft. This contradicts the assumption utilized to develop the required minimum separation distances. It is important that mobile antenna heights greater than the height used to determine minimum separation distances NOT be allowed.

[5]It should be noted that the NPRM considered a 50' HAAT whereas a 50' HAAT has been omitted from the above table. This is due to that fact that the § 80.767 propagation curves do not consider HAAT's below 100'. Accordingly, we do not feel it is appropriate to make additional extrapolated allowances for facilities that might be below 100' HAAT.

In our professional judgment, I/LT mobile antenna heights, due to the nature of the vehicles typically used, can often exceed 6'. Accordingly, we propose that a 10' receiver elevation be used. Thus, we propose that § 90.283(c) be modified to specify that the I/LT mobile antenna height may not exceed 10'. We also propose that a separation table based on 10' receiver heights be used for both I/LT and marine over-land mobiles. The proper correction factor between a 10' receiver and a 30' receiver is 6 dB. Accordingly, the provision of 12 dB of protection to a 17 dBu signal on a 10' receiver means that we utilize 23 dBu service contours and 11 dBu interference contours.

Utilizing the § 80.767 propagation curves and assuming that the marine and I/LT facilities are both 400' HAAT, 400 watt ERP facilities, the following values are obtained:

Marine over-land:

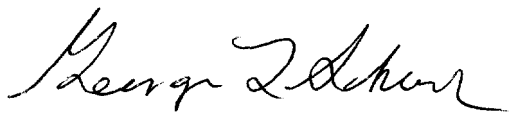
[redacted]

This table provides 12 dB of protection to a 17 dBu signal at a 10 ft receiver.[6] Note, the public coast station is always assumed to be at 400' HAAT, 400 watts ERP. From the above table, the I/LT base station, depending upon its HAAT and ERP, must be from 109 to 137 miles from a marine public coast station.[7]

When there is no public coast station, the NPRM/NOI proposed to protect the nearest coastline of any navigable waterway as if there were a public coast station located at the coastline. Marine facilities are rarely located exactly at the coastline; often they are located several miles inland. Accordingly, we suggest that an additional 5 mi buffer be added to the separation distance. This would provide a reasonable amount of additional protection for someone to locate a future public coast station near the coast line.

CONCLUSION

In order for I/LT to share the marine frequencies without causing harmful electrical interference, a number of engineering considerations must be met. First, the I/LT mobile frequency usage needs to utilize the same base/mobile pairing that is used in the marine service. The I/LT base station frequency needs to be the same as the marine coast station frequency. In addition, the I/LT base station needs to be separated from the marine coast station and/or from navigable waterways by a sufficiently large distance. This separation distance is dependent upon the height and power of the I/LT base station facility. A table of minimum separation distances has been developed and is presented in this report.



George L. Schrenk, Ph.D.
Chairman/CEO
Comp Comm, Inc.

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[6]It should be noted that the NPRM considered a 50' HAAT whereas a 50' HAAT has been omitted from the above table. This is due to that fact that the § 80.767 propagation curves do not consider HAAT's below 100'. Accordingly, we do not feel it is appropriate to make additional extrapolated allowances for facilities that might be below 100' HAAT.

[7]The impact of I/LT's possible adoption of various narrowband technologies has not been considered in this development. Any reduction in the minimum separation distances determined above that can be achieved through I/LT's adoption of various narrowband technologies will require extensive experimental evidence using actual marine units as they are typically found in service. Absent such actual experimental evidence, there is no engineering basis for determining how much additional protection, if any, would be afforded through I/LT's use of narrowband units.

EXHIBIT 1. Required Minimum Seraration Distance
Base-to-Mobile Communications - Paired Channels

CICS Proposal
6' Receive Height

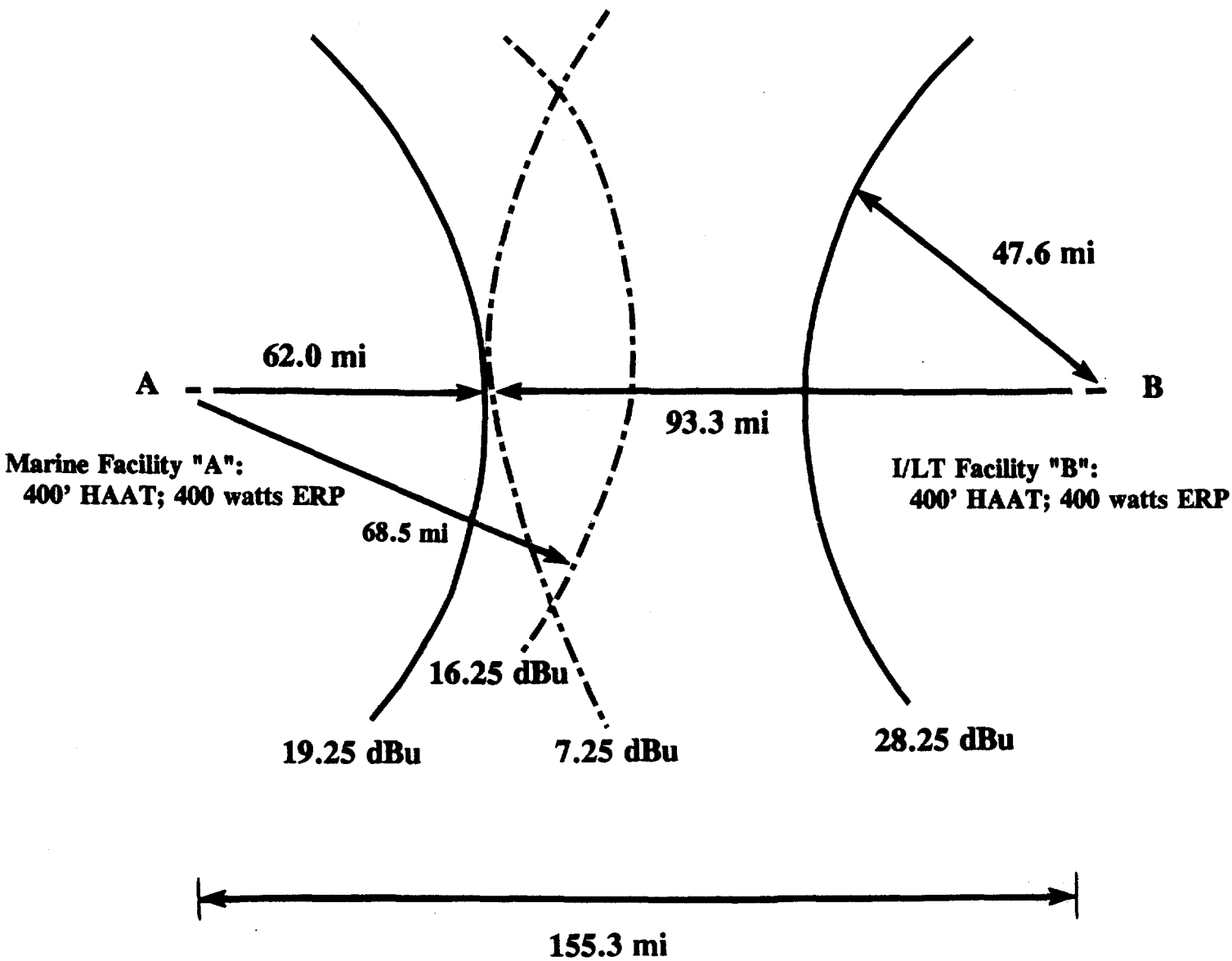

EXHIBIT 2. Required Minimum Separation Distance
Base-to-Mobile Communications - Pairted Channels

6' Receive Height

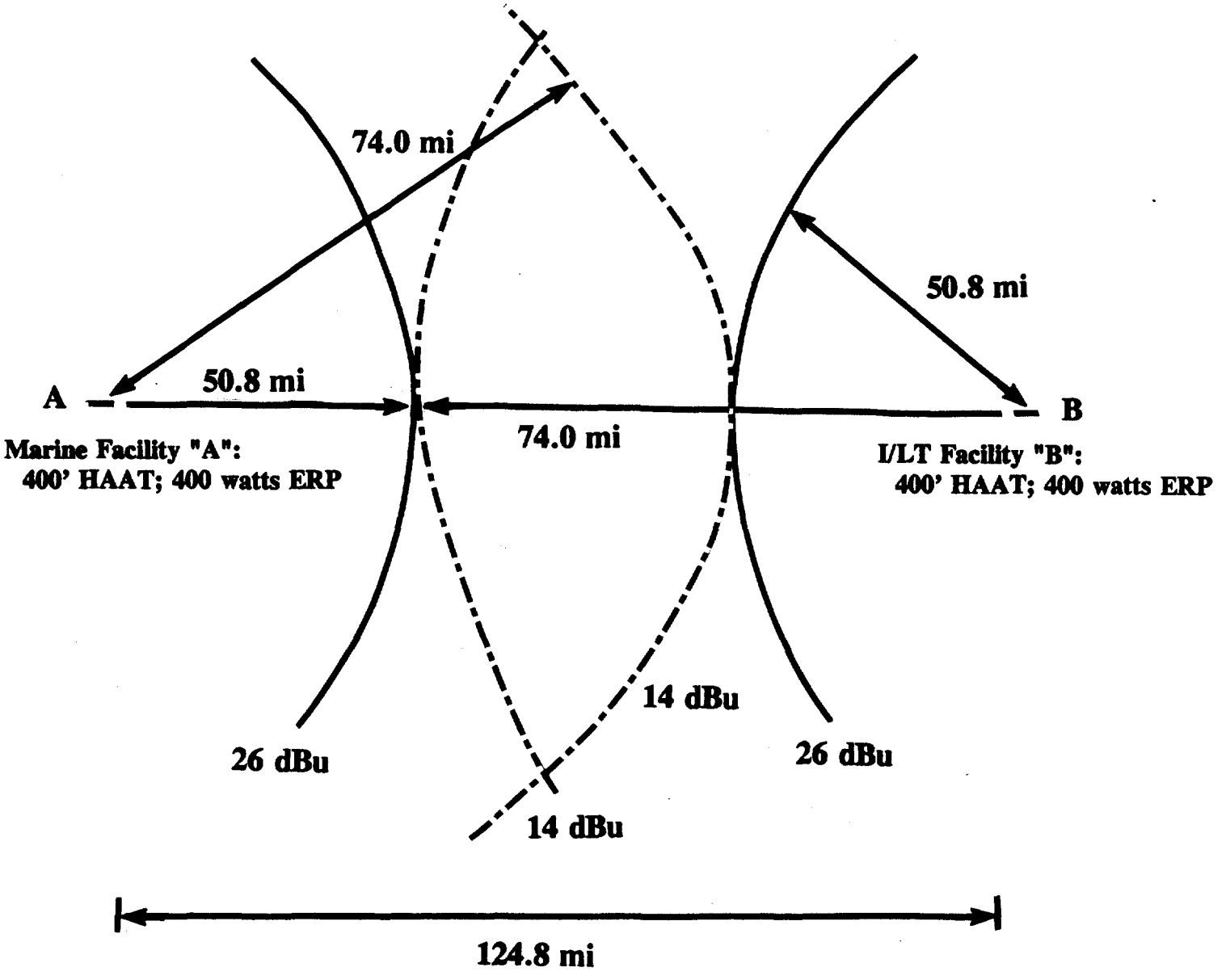

EXHIBIT 3. Required Minimum Separation Distance
Base-to-Mobile Communications - Paired Channels

10' Receive Height